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An Analysis of Disease management in Vegetables

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ABSTRACT: Humans have mostly followed a vegetarian diet since the dawn of time, yet different diseases in vegetables have resulted in significant losses to people in a variety of ways. India is the world's leading vegetarian country, with vegetarians accounting for 38% of the population. Illness may strike any vegetable development at any point of its life cycle, whether it is a pre-harvest or post-harvest disease. To enjoy a superior flavor and nutrients, vegetables should be preserved throughout their life cycle. Bacteria, fungus, virus, and nematodes are the four main pathogens that cause illness in vegetables. Up until recently, isolated farmers have relied on conventional methods to combat crop illnesses. To protect the vegetable, it is essential to identify the illness as soon as possible before beginning therapy. Pesticides and chemicals are used to keep vegetables free of illness. To produce vegetables disease-free without using chemicals or pesticides, an integrated approach should be used all over the globe. It may be utilized for organic plants in the future to control all pathogen-caused illness while also being cost-effective, making it suitable for all distant farmers.

KEYWORDS: Crop, Disease, Management, Pathogens, Plants.

1. INTRODUCTION

With vegetarians accounting for 38 percent of the population, India is the world's top vegetarian country. Vegetarianism became popular in the area with the advent of Buddhism and Jainism in the 6th century BC. Diseases may strike at any time throughout the development of a plant. To safeguard the plant, it's critical to identify the disease's source immediately and treat it as soon as possible. Some life-borne viral illnesses, often known as tiny organisms, may quickly devastate a crop. However, since these illnesses aren't common in any vegetable, it shouldn't be difficult for a farmer to get acquainted with them and take necessary precautions. Inactive illnesses (non-communicable diseases) are more difficult to diagnose. Infectious agents are usually easier to rule out as the cause of a problem before looking into more likely (inert) causes. This emphasizes the need for the farmer to get acquainted with the most common infectious illness that affects the crops[1].

Plant disease causes significant losses to a person in a variety of ways. Hunger and family elimination occurred during or during the Irish potato shortage, which was caused by late blight and the disease Phytophthora infestans. With the virtual eradication of chestnut blight diseases from American chestnuts, which are affected by Cryphonectria-parasitica, there is a loss of valuable resource, as well as immediate financial damage, such as the annual loss of $1 billion to corn farmers in America due to southern corn leaf blight disease and its causative agents, Bipolaris maydis and Cochliobolus maydis. Several vegetable diseases cause less severe damages each year all over the globe, but they all work together to deplete farmers and lower the artistic values of land vegetation and home-grown grounds.

Disease is caused by interactions between the disease mediator, the host, and its environment. If the cause of the communicable illness is close to the moderator, nothing will happen if the environment is favorable to contagion and plant development. Leaf wetness is usually needed for the promotion of spore germination and infection by leafage infectious agents. Infection happens when there is a lot of moisture in the soil and certain very high temperatures in the soil, both of which are combined with specific soil pathogens. Knowing the environmental causes of the most common vegetable diseases allows for more effective management: When environmental causes cannot be altered, measures may be taken to minimize the disease's effect (e.g. fungicide can be functional in progress of a term of constant rainfall which will favour leafage diseases)[2].

The primary goal of vegetable disease management is to reduce the economic and aesthetic harm caused by plant disease. It is often referred to as plant disease control, but current community and ecological standards consider the "switch" to be universal and the duration to be excessively inelastic. However, as a consequence of this shift in mindset, new multidimensional approaches to disorder control and integrated illness management have emerged. Soil fumigation, burning, and the application of pesticides are no longer utilized as single, often unpleasant, processes[3].

Furthermore, disease control methods are often determined by illness forecasting or disease modeling, rather than following a timetable or a prescription. Although it may be difficult to distinguish between the two words, especially when implementing particular actions, illness management can be thought of as active, whereas disease regulation is sensitive.

The foundations of plant disease management include anticipating disease outbreaks and identifying vulnerable factors early in the disease cycle (i.e., feeble relations in the contamination fetter). As a consequence, precise illness identification is necessary in order to identify disease-causing organisms, which is the actual aim of certain disease surveillance programs. Not all illnesses are caused by pathogenic organisms. Identifying whether a sickness is caused by infectious organisms or inert (abiotic) factors requires not only analyzing individual veggies, but also noting down the symptom configuration in an area[4].

On individual vegetables, look for wilts, stunting, leaf spots, distorted leaves, fruit rots, stem blight, and cankers, among other signs. On the roots, galls, root rot, and necrosis should all be checked (lifeless zones). Arenas must be investigated to determine if the problems are widespread and if different plant species in and around the arena are affected, since this may indicate an abiotic cause. Physiological and nutritional symptoms are more prevalent than infectious illnesses within a given region. Pathogens that cause a variety of illnesses will first be divided into areas and then spread out from those zones. Wildflowers and unrelated harvests, on the other hand, are not inherently worried[5]. In Figure 1 shown the different types of Disease Causing Pathogens in Vegetables

1.1 Types of Disease Causing Pathogens in Vegetables:

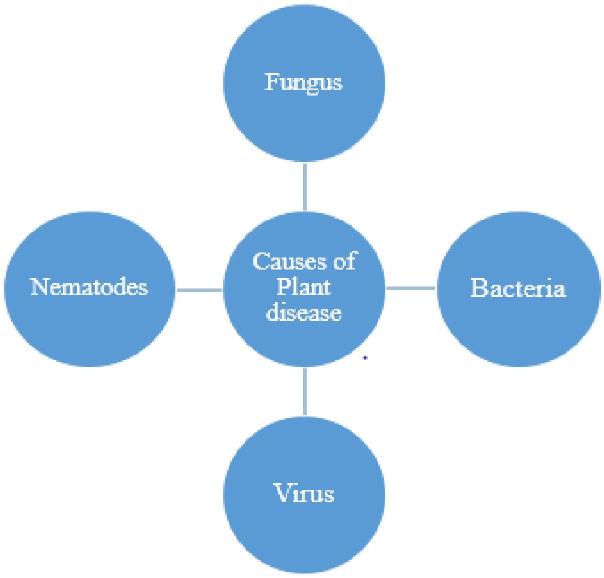

Figure 1: representation pf several causes of disease in vegetables.

1.1.1 Fungi:

To access their nourishment, multicellular small organisms may grow into filamentous threads. Because they have a radial growth pattern, the consequences of their development may be seen as circular blots on surfaces like plant leaves. However, other plant parts, such as roots, may get infected with fungus and generate no apparent structures. These infections may manifest themselves in a number of ways. Burning the water-transferring tissue of the stalk, for example, when grouping by wilt, may indicate a Fusarium wilt infection. Additional disease symptoms, such as blight (tissue death), which may be caused by a variety of factors, may need laboratory testing to rule out fungus as a cause. Numerous fungi that cause infection in leaves need free moisture for disease beginning, such as powdery mildew fungus, which requires just higher humidity to initiate illness[6].

1.1.2 Bacteria:

Bacteria are single-celled tiny creatures that fall dormant in order to live. The most prominent exception to this norm is an infectious pathogen that forms a general layer on potatoes, a multicelled filamentous bacteria that produces spores, which is a reproductive structure. They may be transported by wind-directed rains, insects, or sick plant fragments, such as seeds. Bacterial species that infect leaves may produce circular spots, however bacterial infections are more likely to cause irregularly shaped lesions that do not extend beyond veins. Soft rots of vegetative parts may also happen, and they're usually accompanied by a rotting odor. Additional bacterial infections that produce symptoms such as wilts need research laboratory testing in order to be identified[7].

1.1.3 Viruses:

Viruses are tiny organisms that replicate exclusively in existing plant cells. Insects, for example, are necessary for their transmission to plants. A mosaic pattern on leaves is a typical

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viral symptom, however viruses may also produce other symptoms such as stunting and necrotic lesions, which can be caused by a variety of causes. Insects such as leafhoppers, aphids, thrips, and white flies spread viruses. Viruses may infect a wide range of vegetables, including weeds that aren't botanically related to the crops, and symptoms aren't always apparent in these plants.

1.1.4 Nematodes:

Nematodes are microscopic roundworms that feed on the roots of plants. Root-knot nematode is the cause of root-galls and deformed roots in a broad range of crops. Wilting and death will occur in highly infected plants. Nematodes may produce stubbiness, necrosis, and root stunting, although these symptoms aren't usually apparent. A soil or root analysis is required to confirm the diagnosis.

1.2 Environmental Factors Affecting Plant Pathogens:

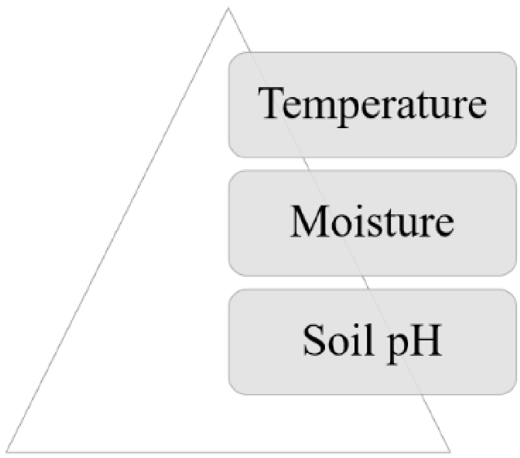

Figure 2: Representation of Different Environmental Factors on Which a Plant Pathogens Depend.

Figure 2 represents several Environmental Factors on Which a Plant Pathogens Depend which have been discussed below:

1.2.1 Temperature:

Suboptimal soil temperatures for seed germination and seedling development may promote the spread of damping off diseases such as Pythium and Rhizoctonia. Planting before the soil temperature increases may also help to minimize the infections' impact. The ideal temperature for foliar pathogen development varies. Bacterial disease signs on leaves are generated at high temperatures, while disease caused by fungus, such as downy mildew, may be prevented. Many diseases, such as late blight of potatoes, have temperature requirements that may be used to accurately distribute fungicides once they are needed.

1.2.2 Moisture:

Moisture exacerbates foliar diseases. To develop and infect, many bacteria and fungus need unrestricted moisture on the plant surface. There is usually a time restriction that must be adhered to. Moisture may also influence the spore development of fungus. This feature serves

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as the foundation for a fungicide selection prediction framework in the treatment of onion purple blotch. Root-rotting pathogenic organisms such as fungus types or Pythium, which cause fruit-rot, may flourish under saturated soil moisture conditions.

1.2.3. Soil pH:

Soil pH has an effect on the behavior of certain soil-borne diseases. Although Fusarium wilt infection is more prevalent in acidic soils, cotton root rot infections are more common in high pH soils. The growth of the ubiquitous potato layer pathogen is slowed in acidic soils. In most cases, however, changing the pH of the soil to manage illness is not feasible.

1.3 Disease Control Methods:

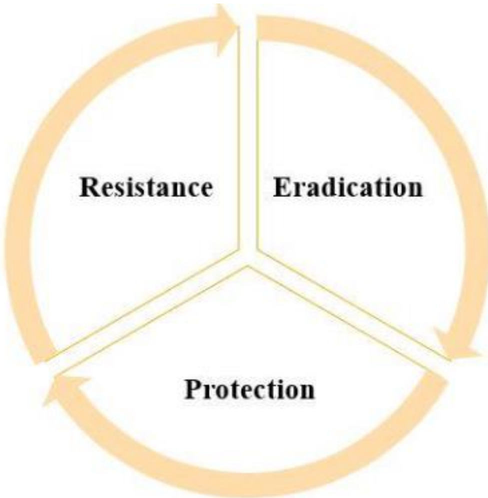

Figure 3: Representation of several disease control methods in vegetables.

Figure 3 represents several disease control methods in vegetables which have been described below.

1.3.1 Resistance:

Plants have a variety of biochemical and structural defense systems to keep them healthy and free from illness. Some of these pathways are activated before to the arrival of infectious pathogens (constitutive conflict), whereas others are activated only after infection (i.e. facilitated conflict)

1.3.2 Eradication

It is the process of removing infectious agents from an environment after they have been administered but before they have developed on their own or spread widely. It may be employed for individual plants, fields, seed lots, or regions, although it is seldom effective over large areas.

1.3.3 Protection:

This idea must be used to separate the moderator plant, the vulnerable region of the moderator plant, or the infectious agents and the moderator plant. The most frequent kind of chemical barrier is fungicide, bactericide, or nematicide, although it may also be spatial, temporal, or physical. Pathogens exist, and contamination will occur without the adoption of preventative measures, depending on the particular procedures used.

2. LITERATURE REVIEW

Masahiro Shishido showed that contemporary technology is brimming with more powerful management tools for crop production and disease control in safe horticulture practices. The new technique of regulating the environment and nutrition of the plants, on the other hand, is driving it to new heights in terms of growth and production. These circumstances may put plants in a stressful position that is difficult to assess in terms of quality and quantity. Over and above any other crop development method, secure horticulture organizations should have a well-organized status for using biological regulatory agents. The most common technique of biological control of plant infection is to train competitors to check populations of infection-causing microbes in the method so that they are unable to contaminate crops, or at the very least, to reduce their capacity to do so. Trichoderma species, which are tough partners of disease-causing fungus like Botrytis cinerea and are helpful to protect wound area and prevent infectious agents from colonizing wound region, are among the optimistic biological regulating agents[8].

Plant diseases are caused by fungi (mold), bacteria, viruses, and nematodes, according to Steve Bost. These viruses do not affect people, but they may cause significant damage to plants. To keep an eye on illness, gardeners must adopt proactive and reactive steps. Pesticides may harm plants, animals, and humans if they are applied improperly (insecticides, fungicides, herbicides, etc.). Pesticides should be used in such a way that they do not damage humans, livestock, crops, beneficial insects, fish, or animals. Pollinating agents will be harmed as a result. Inhaling pesticides for an extended period of time may be uncomfortable, therefore appropriate protective clothing should be used. Empty pesticide containers are eventually disposed of in line with the law. It is always the pesticide applicator's legal duty to read and follow all current label directions for the pesticide in question[9].

According to Isaac Kojo Arah et al., the postharvest attribute control of tomatoes begins on the field and continues until it is accomplished by the ultimate consumer. In part, the post-harvest attribute grade of fruitlets is based on a few pre-harvest performances that are accepted throughout the manufacturing process. The quality of certain fruit after it has been harvested cannot be improved by using any post-harvest cure method or management practices, but it can only be kept. Accepting and managing the many parts that pre-harvest factors such as fertiliser usage, cropping, ripening stage, farmer selection, and irrigation may display in the attribute of fruit at harvest is critical to producing bigger attribute fruits at yield. Tomatoes are very sensitive, and quality degradation occurs quickly after harvest. The quality and storage lifespan of tomatoes after harvest is affected not just by post-harvest factors, but also by a few pre-harvest factors during generation, and unless both elements are addressed properly, excellence damage remains a major problem for tomato growers and managers[10].

3. DISCUSSION

In India, which ranks top in the globe, vegetarians account for 38 percent of the population. Vegetarianism became increasingly prevalent in the area with the advent of Buddhism and Jainism in the 6th century BC. Standard regulatory techniques have evolved over time and are now routinely employed in concentrated greenhouse farming. Recent methods have provided the most effective regulating tools for crop growth and disease management in protected horticulture systems, however. Precision environmental and nutritional management that maximize photo-synthates against blooms and fruits are pushing plants to new heights of growth and production. Under these conditions, plants may be exposed to stressful conditions that are difficult to describe and quantify. These factors seem to favor a few illnesses that aren't often seen in out-of-field agricultural situations. To minimize the influence of these biotic variables on the plants, efficient crop production requires the control of crop diseases and pests. As stated in this research, using the ecosystem to regulate disease has resulted in current years of development due to the use of environmental control accommodations and a better understanding of the biology of the plant pathogen. However, in the future, these cutting-edge technologies will need to be further integrated into an advanced herbal farming system with a complete disease and pest management approach to improve disease control efficacy in protected horticulture. The concept of Integrated Disease Management was inspired by entomologists' successful IPM (Integrated Pest Management) methods for controlling insects and mites (IDM). In certain cases, IDM involves reconnaissance and the quick application of a range of methods and strategies. Site selection and planning, the use of resistant farmers, changing planting practices, modifying the land via irrigation, pruning, drainage, thinning, shading, and other methods, and, if appropriate, pesticide usage are all options. The management system requires constant monitoring of environmental factors (moisture, soil pH, temperature, nutrients, and so on), as well as disease prediction and budgetary constraints. These stages should be executed in an organized, integrated, and harmonised way to maximize the advantages of each component.

4. CONCLUSION

Diseases may attack at any moment throughout a plant's development. To safeguard the plant, it's essential to identify the cause of the illness and cure it as soon as feasible. Infectious illnesses spread by live creatures, such as tiny organisms, may decimate a crop in a matter of days. From production to consumption, postharvest disease losses may occur at any stage throughout the postharvest management process. When calculating postharvest disease losses, it's critical to consider fruit quantity and quality, since certain illnesses don't render produce unsellable but do decrease product value. Plant diseases are caused by fungi (moulds), bacteria, viruses, and nematodes, among other things. Although these viruses are not harmful to people, they may harm plants significantly. Gardeners must be aware of disease management and adopt appropriate preventative and reactive measures. It is critical to be able to properly identify diseases and other plant issues in order to apply effective control methods. It is recommended that gardeners get familiar with the signs and symptoms of plant diseases. The primary goal of vegetable infection management is to reduce the aesthetic and financial damage caused by plant disease. It may be utilized for organic farming in the future, with the aid of various advanced technology to monitor plant health and the spread of disease that can be physically seen. New applications and gadgets are being used to monitor the ideal plant development environment as well as disease-causing microorganisms.

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